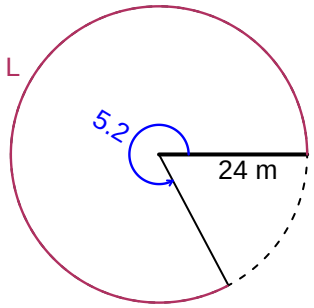
Name: Date:

Trig Final (Solution v46)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 24 meters. The angle measure is 5.2 radians. How long is the arc in meters?

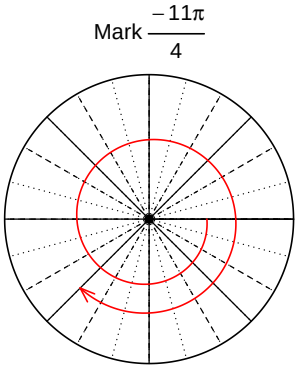


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

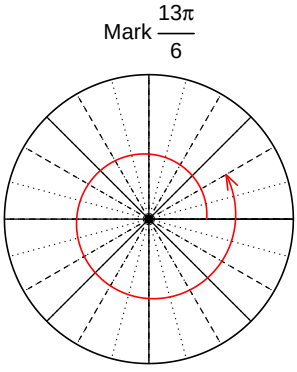
$L = 124.8$ meters.

Question 2

Consider angles $\frac{-11\pi}{4}$ and $\frac{13\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-11\pi}{4}\right)$ and $\cos\left(\frac{13\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\sin(-11\pi/4)$



Find $\cos(13\pi/6)$

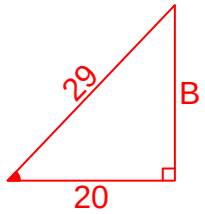
$\sin(-11\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(13\pi/6) = \frac{\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{-20}{29}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.

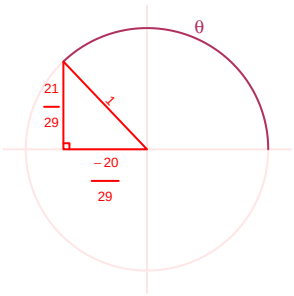
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$20^2 + B^2 = 29^2$$
$$B = \sqrt{29^2 - 20^2}$$
$$B = 21$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{21}{29}}{\frac{-20}{29}} = \frac{-21}{20}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 4.47 Hz, a midline at $y = -2.96$ meters, and an amplitude of 8.66 meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -8.66\sin(2\pi 4.47t) - 2.96$$

or

$$y = -8.66\sin(8.94\pi t) - 2.96$$

or

$$y = -8.66\sin(28.09t) - 2.96$$